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(54) GLASS SUBSTRATE AND METHOD OF MANUFACTURING IT AND RECORDING MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent alkali elution from the surface of glass substrate without reducing strength and improve reliability especially under high temperature and humidity. SOLUTION: A glass substrate is immersed in an aqueous solution containing lithium salts for exchanging Li+ in the aqueous solution to Na+ and K+ on the surface of the glass and strongly binding Li+, which has the smaller ion diameter than that of Na+ and K+, with non-crosslinking oxygen in the glass for effectively preventing alkali elution. The glass substrate is used for a recording medium with high reliability.

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CLAIMS

[Claim(s)]

[Claim 1]A glass substrate, wherein it is a glass substrate in which it comes to give processing which controls elution of a glass component and said processing is the processing contacted in solution containing lithium salt.

[Claim 2]A manufacturing method of a glass substrate performing processing which contacts a substrate which consists of glass materials in solution containing lithium salt, and controls elution of a glass component.

[Claim 3]A manufacturing method of the glass substrate according to claim 2 which is the processing in which not less than 100 ** lithium nitrate solution 200 ** or less is made to immerse said substrate with which said processing consists of glass materials.

[Claim 4]A manufacturing method of the glass substrate according to claim 2 or 3 which is the processing to which said processing contacts said substrate which consists of glass materials at solution of pH 5 containing lithium salt - pH9.

[Claim 5]A manufacturing method of the glass substrate according to any one of claims 2 to 4 which fabricates said substrate which pressurizes a glass material which carried out heat softening with a metallic mold, and consists of glass materials.

[Claim 6]A manufacturing method of the glass substrate according to any one of claims 2 to 5 which performs chemical strengthening treatment to said substrate which consists of glass materials, and performs said processing which controls elution of a glass component to said substrate after chemical strengthening treatment.

[Claim 7]A manufacturing method of the glass substrate according to any one of claims 2 to 6 in which said glass component which controls elution is alkaline ion.

[Claim 8]A manufacturing method of a recording medium forming a recording layer in a glass substrate manufactured by a manufacturing method of the glass substrate according to any one of claims 2 to 7 at least.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the manufacturing method of the recording medium which used the manufacturing method of a glass substrate and a glass substrate, and it.

[0002]

[Description of the Prior Art]In recent years, rapid high recording density-ization is following the magnetic disk which is a magnetic recording medium. Although the magnetic disk drive has realized random access by surfacing a magnetic head slightly and making the magnetic-disk top which carries out a high velocity revolution scan, In order to reconcile high recording density and rapid access, raising the number of rotations of a magnetic disk and making small the interval (head flying height) of a magnetic disk and a magnetic head are called for.

[0003]Although the substrate material of the magnetic disk had conventionally the aluminum substrate in use which performed nickel-P plating, even if it carries out a high velocity revolution by high rigidity from the request of the miniaturization of a magnetic disk, slimming down, the reduction in surfacing of a magnetic disk, etc., it is hard to change, and the rate that the high glass substrate of surface smooth nature is used is increasing.

[0004]In order to lower a melting point and to improve vitrification and a moldability, the alkaline metal is added several percent - about ten% by the glass material used for this glass substrate. However, since an atomic radius is small and it is easy to carry out migration, these alkaline metals deposit on the surface gradually, and it combines with the carbon dioxide and halogen in the atmosphere, and they deposit as carbonate or a chloride. The elution phenomenon of this alkali component is remarkable under high-humidity/temperature, and record reproduction becomes impossible and it becomes a cause which serves as an error directly, or carries out transfer to a magnetic head, bars that surfacing, or makes it corrode and

worsens reliability.

[0005]

[Problem(s) to be Solved by the Invention]For this reason, various proposals for controlling elution of an alkali component are made from the former, for example, in JP,10-226539,A. After the chemical strengthening treatment immersed in the fused salt of sodium nitrate and potassium nitrate, It is immersed in warm water, and washes, and the alkaline ion closure processing further immersed in heat concentrated sulfuric acid is proposed, and contacting the glass substrate for magnetic recording to the fused salt of hydrogensulfate or pyrosulfate, and controlling elution of a glass component is proposed in JP,2000-82211,A.

[0006]However, the movement toward a raise in recording density in these days cannot require control of alkaline elution on a higher level, and cannot fully fill the demand with the above Prior arts.

[0007]If it is going to heighten the depressor effect of alkaline elution, in JP,10-226539,A which performs acid treatment. In JP,2000-82211,A which the skeleton of glass itself is destroyed, and an alkaline ion elution volume increases on the contrary, and performs processing by fused salt. Since processing is an elevated temperature, in the glass substrate which performed chemical strengthening treatment, diffusion of the ion which forms surface compression stress, and the distorted relaxation by heat start, and the technical problem that it is easy to produce a strong fall occurs.

[0008]In view of the above-mentioned point, it succeeded in this invention, and it is ****. The purpose is to provide the glass substrate which there is no strength deterioration and can control elution of an alkali component etc. on a high level, its manufacturing method, and the manufacturing method of the recording medium using it also in the prolonged use in the bottom, and preservation.

[0009]

[Means for Solving the Problem]In order to attain the above-mentioned purpose, it constitutes from this invention as follows.

[0010]That is, a glass substrate of this invention is a glass substrate in which it comes to give processing which controls elution of a glass component, and is processing contacted in solution in which said processing contains lithium salt.

[0011]By making solution containing lithium salt contact according to this invention, Li^+ in solution performs Na^+ and K^+ which are the alkaline ion of a glass surface, and ionic exchange, Compared with Na^+ and K^+, Li^+ with a small ion radius will be strongly connected with non-bridging oxygen in glass, elution will decrease compared with other alkaline ion, and elution will be controlled effectively. And since it is processing by solution, there is also no

degradation of intensity like a conventional example which carries out **** high temperature processing for fused salt.

[0012]

[Embodiment of the Invention]The glass substrate of this invention according to claim 1 is a glass substrate in which it comes to give processing which controls elution of a glass component, Said processing is the processing contacted in the solution containing lithium salt, Compared with Na^+ and K^+, Li^+ in solution with a small ion radius, There is also no degradation of intensity like the conventional example which can perform Na^+ of a glass surface, K^+, and ionic exchange, can be strongly connected with non-bridging oxygen in glass, and can control elution of a glass component effectively, and carries out **** high temperature processing for fused salt.

[0013]The manufacturing method of the glass substrate of this invention according to claim 2, It is what contacts the substrate which consists of glass materials in the solution containing lithium salt, and performs elution control processing of a glass component, Compared with Na^+ and K^+, Li^+ in solution with a small ion radius, There is also no degradation of intensity like the conventional example which can perform Na^+ of a glass surface, K^+, and ionic exchange, can be strongly connected with non-bridging oxygen in glass, and can control elution of a glass component effectively, and carries out **** high temperature processing for fused salt.

[0014]The invention according to claim 3 is a manufacturing method of the glass substrate according to claim 2, Said processing is the processing in which not less than 100 ** lithium nitrate solution 200 ** or less is made to immerse said substrate which consists of glass materials, solubility of a lithium nitrate is high, and since the boiling point of solution also goes up, the processing for hot efficient elution control is attained at high concentration. Since it processes at the temperature of 200 ** or less, also to the glass substrate which performed chemical strengthening treatment, there is almost no influence on a surface compressive stress layer, and a strong fall hardly takes place.

[0015]The invention according to claim 4 is a manufacturing method of the glass substrate according to claim 2 or 3, Said processing is the processing which contacts said substrate which consists of glass materials in the solution of pH 5 containing lithium salt - pH9, and it has not been said by using almost neutral solution that a glass skeleton is destroyed.

[0016]The invention according to claim 5 is a manufacturing method of the glass substrate according to any one of claims 2 to 4, Since said substrate which pressurizes the glass material which carried out heat softening with a metallic mold, and consists of glass materials is fabricated, the alkaline ion in glass is spread in a glass surface at the time of pressing and alkali component concentration becomes high, In the processing for elution control, ionic

exchange of Li^+ in solution, and Na^+ and K^+ is performed efficiently.

[0017]The invention according to claim 6 is a manufacturing method of the glass substrate according to any one of claims 2 to 5, A glass surface can be strengthened, while being able to perform chemical strengthening treatment to said substrate which consists of glass materials, being able to perform said processing which controls elution of a glass component to said substrate after chemical strengthening treatment and being able to control elution of a glass component.

[0018]The invention according to claim 7 is a manufacturing method of the glass substrate according to any one of claims 2 to 6, and said glass component which controls elution is alkaline ion, and it can control elution of Na^+ or K^+.

[0019]The manufacturing method of the recording medium according to claim 8 is what forms a recording layer in the glass substrate manufactured by the manufacturing method of the glass substrate according to any one of claims 2 to 7 at least, Since a recording medium is manufactured using a glass substrate without the strength deterioration which controlled elution of the glass component effectively, the recording medium of high reliability can be obtained.

[0020]Hereafter, an embodiment of the invention is described in detail.

[0021]This invention contacts a glass substrate in the solution containing lithium salt, and is characterized by performing processing (henceforth "elution control processing") which controls elution of a glass component.

[0022]Here, also when contacting only one field of a glass substrate besides in the case of making it contact being immersed in solution, it contains.

[0023]Li^+ in solution performs Na^+ of a glass surface, K^+, and ionic exchange by contacting a glass substrate in the solution containing lithium salt. Li^+ has a small ion radius as compared with Na^+ or K^+, is strongly connected with non-bridging oxygen in glass, and there is little elution as compared with other alkaline ion, and it can control elution of alkaline ion effectively by this. And since it is elution control processing by solution, there is also no degradation of intensity like the conventional example which carries out **** high temperature processing for fused salt.

[0024]As a result of X linear-light electronic spectroscopic analysis's analyzing the glass composition on the surface of a glass substrate of one example which performed elution control processing by the solution containing this Li salt, it was checked that the presentation of K and Na on the surface of a glass substrate is below 0.5% (atomic ratio).

[0025]Drawing 1 is a shown figure the relation of the depth of a surface portion and metallic ion concentration in the glass substrate of this one example, and by elution control processing. It turns out that a lithium ion performs the sodium ion, potassium ion, and ionic exchange of a

glass surface, and the layer with many lithium ions is formed in the outermost surface of glass.
[0026]As solution containing the lithium salt used for this invention, solution, such as the nitrate of lithium, sulfate, carbonate, an phosphate, a chloride, and fluoride, or the solution of these mixtures can be mentioned.
[0027]It is preferred to carry out by immersing a glass substrate in these solution. In these lithium salt, the solubility of a nitrate to water is highly preferred. When lithium salt exists in high concentration, though it goes up and is solution, processing at not less than 100 ** is possible for the boiling point of solution. In the case of a lithium nitrate, 180 ** processing is possible by adding a 2600-g lithium nitrate to 1000 g of water.
[0028]Although the depressor effect of alkaline ion elution has the effective one where treatment temperature is higher, if treatment temperature is too high, in the glass substrate which performed chemical strengthening treatment, diffusion of the ion which forms surface compression stress, and the distorted relaxation by heat will arise, and a strong fall will produce it. For this reason, as for treatment temperature, 100 ** - 200 **, and 130 more ** - 180 ** are preferred.
[0029]Although the longer one of processing time is effective, alkaline ion elution depressor effect is not acquired as processing time is 1 or less minute. Even if it exceeds 2 hours, alkaline ion elution depressor effect does not change. When a 2600-g lithium nitrate is added to 1000 g of water, 100 ** - 180 ** of treatment temperature is 130 ** - 180 ** preferably. Even if the elution depressor effect of alkaline ion is not acquired but processing time exceeds 2 hours in 1 or less minute, elution depressor effect does not change.
[0030]Preferably, it is pH 5-9, and the pH of the solution containing the Li salt used for this invention is neutral more preferably, is small, and does not produce the destruction of a glass skeleton or the aggravation of surface nature by elution control processing. [of the operation which invades glass like acid or alkali]
[0031]Before processing a glass substrate in the heated Li-salt solution in this invention, in order to prevent a crack of a glass substrate, it is preferred to preheat a glass substrate at 100 ** - 150 **.
[0032]While being immersed in the solution of elution control processing, i.e., a treating solution, in order to be able to carry out the ionic exchange of the whole surface of a glass substrate uniformly, It is desirable to keep the portion which does not contact a treating solution in a main table side in the state where supported the glass substrate in the end face, supported the field of maintenance, i.e., the thickness direction of a substrate, at two or more places, and it stood in accordance with the perpendicular direction substantially from existing as much as possible.
[0033]In this invention, publicly known washing processings, such as washing arbitrary [in a manufacturing process] set in process and according according to necessity to cleaning by

scrubbing and commercial detergents (neutral detergent, a surface-active agent, an alkaline detergent, etc.), pure water washing, solvent cleaning, and solvent vapor desiccation, can be performed. Heating and ultrasonic impression may be performed in each washing process.

[0034]As a glass material of the glass substrate used for this invention, soda lime glass, aluminosilicate glass, aluminoborosilicate glass, borosilicate glass, etc. are mentioned, for example. The effect of aluminosilicate glass by chemical strengthening treatment is large, and it is preferred from the point that a high intensity board is obtained.

[0035]In the glass substrate which carried out pressing also to the glass substrate produced with the polish construction method although it was effective, elution control processing of the glass component of this invention is more effective. That is, as compared with the glass substrate by polish usual [glass substrate / which was produced by pressing] in a surface alkali component, this with high alkali component concentration is because alkaline ion, such as sodium ion in glass and potassium ion, is spread in a glass surface at the time of pressing. Therefore, the sodium ion and potassium ion of elution control processing in which Li^+ and ionic exchange are possible exist on the surface mostly, and ion exchange capacity is highly effective.

[0036]In front of shaping, the glass material which carries out pressing is a cylindrical shape 5-10 mm in thickness, and 5-40 mm in diameter, for example, and it is preferred to be fabricated so that it may be set to 0.3-1.0 mm in thickness and 20-100 mm in diameter after shaping. The pressing by a metallic mold puts a glass material between a metallic mold, and after heating until a glass material becomes soft, it applies and carries out a pressure. As for the pressure applied to a glass material, it is preferred that it is 20 - 500 kg/cm^2. The problem that a glass material will not serve as predetermined thickness if a pressure is small, but the display flatness of a die surface will fall if a pressure is large, and it becomes a cause of a crack, and the load further added to a metallic mold becomes large arises.

[0037]This invention is effective also to the glass substrate which performed chemical strengthening treatment if needed. Chemical strengthening treatment immerses a glass substrate in the chemical-strengthening-treatment liquid fused with heating, and performs it by the method of carrying out ionic exchange of the ion of a glass substrate surface layer with the ion in chemical-strengthening-treatment liquid, i.e., an ionic exchange method. As an ionic exchange method, there are a low temperature form ionic exchange method and a high temperature form ionic exchange method. If the damage to the viewpoint and glass surface of energy efficiency is taken into consideration, it is preferred to adopt a low temperature form ionic exchange method. In a low temperature form ionic exchange method, it is immersed in the chemical-strengthening-treatment liquid in the temperature range below glass transition temperature (Tg), The alkaline ion near the glass substrate surface, for example, Li^+, and Na^+

are replaced by alkaline ion with a larger ion radius than it, for example, Na^+, and K^+, by the increase in capacity of a portion which carried out ionic exchange, compression stress strong against a glass surface is generated, and a glass surface is strengthened.

[0038]As chemical-strengthening-treatment liquid, potassium nitrate (KNO_3), sodium nitrate ($NaNO_3$), Fused salt, such as potassium carbonate (K_2CO_3), and the fused salt of the things (for example, KNO_3+$NaNO_3$, KNO_3+K_2CO_3, etc.) which mixed these salts can be used.

[0039]As for the temperature of chemical-strengthening-treatment liquid, in order to promote ionic exchange, it is preferred that it is an elevated temperature, but in order to prevent modification of a glass substrate, below glass transition temperature is preferred. For example, as for especially the temperature of chemical-strengthening-treatment liquid, when a glass transition point processes the glass substrate which consists of a glass material which are 450 ** - 800 **, it is preferred that they are 350 ** - 450 ** 350 ** - 700 **.

[0040]As for immersion time, it is desirable that it is 0.5 to 20 hours. The effect of chemical strengthening is insufficient in 0.5 or less hour, the surface is ruined and smoothness falls in 20 hours or more.

[0041]Before a glass substrate is immersed in chemical-strengthening-treatment liquid in order to prevent a crack and cracking of a glass substrate, and in order to prevent the fused salt in chemical-strengthening-treatment liquid from crystallizing in the glass substrate surface when carrying out chemical strengthening, it is desirable to preheat a glass substrate at 200 ** - 350 **.

[0042]In the state where supported the glass substrate in the end face, supported the field of maintenance, i.e., the thickness direction of a substrate, at two or more places, and it stood in accordance with the perpendicular direction substantially in order that the whole surface of a glass substrate might carry out chemical strengthening uniformly, while being immersed in chemical-strengthening-treatment liquid. It is desirable to keep the portion which does not contact a treating solution in a main table side from existing as much as possible.

[0043]The magnetic recording medium as a recording medium of this invention formed the magnetic recording layer as a recording layer at least on the glass substrate which performed elution control processing as mentioned above. Here, a publicly known thing can be used as a magnetic recording layer or other layers.

[0044]Usually, for example a magnetic recording medium forms Cr foundation layer, a Co-Cr-Pt system magnetic layer, and C protective layer one by one using a sputtering technique, applies fluorine system liquid lubricant using a dip coating method, and uses it as a magnetic recording medium.

[0045]Since the glass substrate which controlled elution of alkaline ion remarkably is being used for the magnetic recording medium of this invention, it is excellent in weatherability and a

life, and shows high reliability.

[0046]The glass substrate obtained by this invention is applicable to an optical material, a building material, a machine part, etc.

[0047]

[Example]Hereafter, the example of this invention is explained.

(Example 1) The glass substrate in this example was manufactured by the following forming cycle **** elution control down stream processing, and the magnetic recording medium was further manufactured through stage film formation.

(1) As a forming cycle substrate material, the glass material of the cylindrical shape which consists of alumina silicate system glass of 690 ** of softening temperatures was prepared. Couple preparation of the metallic mold which consists of cemented carbide of a tungsten carbide system was carried out as a metallic mold for pressing. The press face of this metallic mold is flat, sputtering was carried out to the field in which mirror surface finish was carried out by polish so that a platinum alloy might be set to 1 micrometer as a protective film, and arithmetical mean deviation of profile obtained the surface which is 1 nm. After inserting the glass material into the press face of a metallic mold and heating to 690 **, pressing applied the pressure of 350 kg/cm^2, and it performed it until the glass material became predetermined thickness. Application-of-pressure time was about 1 minute. After pressing, it cooled and the glass substrate for disks 0.64 mm in thickness and 84 mm in diameter was obtained.

(2) The glass substrate which finished the elution control down-stream-processing above-mentioned pressing process was processed in the solution containing Li salt. What heated the solution which added 2600g of $LiNO_3$ to 1000 g of pure water at 130 ** as a treating solution was prepared. After preheating the above-mentioned glass substrate at 100 **, it carried out by being immersed for 1 hour. On the occasion of immersion, it held in the end face of the glass substrate so that the glass substrate surface might be processed uniformly. The glass substrate which finished the above-mentioned elution control processing was fully rinsed using the cleaning by scrubbing using neutral detergent and PVA sponge, alkali detergent washing (2% semi clean (trade name) pH=12, the product made from the Yokohama fats and oils), and not less than 18-M omega ultrapure water, and isopropyl-alcohol-steam desiccation was performed.

(3) The sputtering technique was used for the glass substrate which performed the stage-film-formation above-mentioned processing, Cr foundation layer, the Co-Cr-Pt system magnetic layer, and C protective layer were formed one by one, fluorine system liquid lubricant was applied using the dip coating method, and it was considered as the magnetic recording medium.

[0048]Evaluation of the glass substrate and magnetic recording medium which were manufactured as mentioned above was performed as follows. That is, it carried out by the error

number measurement in the anti-chip box intensity in a glass substrate, the amount of alkaline elution, surface roughness, and a magnetic recording medium. Each appraisal method is shown in Table 1. [0049]

[Table 1]

ガラス基板及び磁気記録媒体の評価法

No.	項目	方法	サンプル
①	アルカリ溶出量	ガラス基板を超純水にて 80℃, 24hr の抽出を行ない、その抽出液のアルカリ濃度をイオンクロマトグラフィにて測定し、mmol./㎡で示す。	ガラス基板
②	表面粗さ	処理前後の表面粗さを AFM（原子間力顕微鏡）にて測定	ガラス基板
③	エラー数	80℃, 80%, 1000hr 放置前後のエラー数を比較する。	磁気記録媒体

(Example 2) In elution control processing, Example 2 made temperature of the treating solution 170 **, except having made processing time into 10 minutes, was manufactured and evaluated it by the same conditions as Example 1.

(Examples 3 and 4) The respectively same conditions as Examples 1 and 2 manufactured and estimated Examples 3 and 4 except having performed the forming cycle by the polishing process. After the glass substrate by polish cuts down a glass plate with a thickness of 1 mm which consists of the same glass material as what was used in Example 1 to phi65mm, After grinding until thickness was set to 0.64 mm using cerium oxide, it obtained by grinding so that arithmetical mean deviation of profile may be set to 1 nm or less using colloidal silica.

(Example 5) Example 5 is the same as Example 1 except having performed chemical strengthening treatment between a forming cycle and elution control down stream processing. That is, chemical strengthening treatment is performed after washing the glass substrate which finished the forming cycle. Chemical strengthening treatment prepared the chemical-strengthening-treatment liquid which mixed potassium nitrate (60%) sodium nitrate (40%), heated this chemical-strengthening-treatment liquid at 400 **, immersed the above-mentioned glass substrate preheated at 350 ** for 2 hours, and was performed. On the occasion of immersion, it held in the end face of the glass substrate so that a glass surface might be processed uniformly. The glass substrate which finished the above-mentioned chemical strengthening treatment was annealed to 200 **, and it was immersed in a 20 ** tank, quenched, and was neglected for about 20 minutes. Then, he fully rinsed using the cleaning by scrubbing and the not less than 18-M omega ultrapure water using neutral detergent and PVA sponge, and line-did isopropyl-alcohol-steam desiccation.

(Example 6) Example 6 evaluated by manufacturing on the same conditions as Example 5 except having performed the forming cycle by the polishing process. The glass substrate by polish prepared the same thing as Example 2.

(Comparative example) It is the same as Example 1 except the processing in elution control

down stream processing. The elution control processing condition performed as a comparative example is shown in Table 2. The comparative example 1 is the same as Example 1 except omitting elution control processing. The comparative example 2 is the same as Example 1 except the treatment temperature of elution control processing having been 100 ** or less 80 **. The comparative example 3 is the same as Example 1 except what added nitric acid to the treating solution of Example 1, and adjusted pH to five or less 2. The comparative example 4 is the same as Example 1 except what added lithium hydroxide to the treating solution of Example 1, and adjusted pH to nine or more 12.

[0050]

[Table 2]

処理条件

	処理剤	温度	時間
比較例 1	未処理	—	—
比較例 2	$LiNO_3$ 水溶液	80℃	10 時間
比較例 3	HNO_3、$LiNO_3$ 水溶液	130℃	1 時間
比較例 4	LiOH、$LiNO_3$ 水溶液	130℃	1 時間

(Evaluation result) The evaluation result of Examples 1-6 and the comparative examples 1-4 is shown in Table 3.

[0051]

[Table 3]

評価結果

	ガラス基板			磁気記録媒体		評価
	アルカリ溶出量 (mmol/m²)	表面粗さ Ra (nm)		エラー数 (個/面)		
		処理前	処理後	放置前	放置後	
実施例 1	0.04	1.20	1.26	15	19	○
実施例 2	0.06	0.95	0.98	18	20	○
実施例 3	0.08	0.89	0.93	17	25	○
実施例 4	0.09	0.98	1.02	18	26	○
実施例 5	0.02	1.06	1.09	17	17	○
実施例 6	0.03	1.10	1.16	19	20	○
比較例 1	0.85	1.02	2.06	19	355	×
比較例 2	0.49	1.12	1.86	16	132	×
比較例 3	0.83	0.98	2.50	18	450	×
比較例 4	0.23	0.98	4.32	205	660	×

As for Examples 1-6, by elution control processing, the amount of alkaline elution is decreasing sharply and most increases in an error number are not seen. The thing (examples 1 and 2) using a formed glass board is understood that a formed glass board is [which has few amounts of alkaline elution] more effective than a polish board (examples 3 and 4). The amount of alkaline elution decreases further (examples 5 and 6), and by performing chemical strengthening treatment shows that concomitant use of this processing is very effective.

[0052]Since elution control processing had not been carried out, alkali corrosion (deposit of carbonate and a chloride) occurred, and the error number increased the comparative example 1 by 80 **80% 1000 hours by neglect.
[0053]Even if treatment temperature is 100 ** or less and the comparative example 2 lengthens processing time with 10 hours, sufficient alkali corrosion preventive effect is not acquired. The surface roughness after processing also increased and the error number increased 80 **80% 1000 hours by neglect.
[0054]Since the concentration of hydronium ion is high at less than five, the diffusion to the glass surface of Li is suppressed for pH, and as for the comparative example 3, the caustic embrittlement preventive effect is not acquired. Furthermore, glass surface roughness has occurred.
[0055]pH is over nine, glass surface roughness generated the comparative example 4 by the dissolution of the silica from a glass surface, and a caustic embrittlement preventive effect was not acquired, but the error number became a high value from before neglect.
[0056]As mentioned above, by contacting a glass substrate in the solution containing lithium salt, there is neither aggravation of the surface nature of glass nor strong degradation, and elution of a glass component, especially an alkaline ion ingredient can be prevented. It checked that this effect of the glass substrate obtained by carrying out pressing of the glass material which carried out heat softening was high. This processing is effective also to the glass substrate which performed chemical strengthening. Since a magnetic recording medium is manufactured using the glass substrate which furthermore performed this processing, i.e., a glass substrate without the strength deterioration which controlled elution of the glass component effectively, the magnetic recording medium of high reliability can be obtained.
[0057]
[Effect of the Invention]By this invention, a glass substrate is contacted in the solution containing lithium salt as mentioned above.
Therefore, while being able to control elution of a glass component effectively, there is also almost no strong degradation.
A reliable recording medium can be obtained by using the glass substrate which performed elution control processing of the glass component.

[Translation done.]